RESTRICTED

TM 11-405

WAR DEPARTMENT

TECHNICAL MANUAL

PHOTOGRAPHIC DARKROOM EQUIPMENT

PROCESSING EQUIPMENT PH-406

May 12, 1943

TECHNICAL MANUAL

PHOTOGRAPHIC DARKROOM EQUIPMENT PROCESSING EQUIPMENT PH-406

CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 14 October 1948

TM 11-405, 12 May 1943, is changed as follows:

1. Purpose

Processing Equipment PH-406 * * * from these negatives.

Note (Added). Processing Equipment PH-406 procured on Order No. 11426-Phila-47-77 is identical to the equipment described in this manual, except as noted.

2. Components

The components of Processing Equipment PH-406 are—

* * * * * * *

1 Timer PH-426, automatic, electric; **1 Timer PH-426-A on Order No. 11426-Phila-47-77.**

* * * * * * *

2 Trays PH-161-A, stainless steel, 11 by 14 inches; **3 Trays PH-161-A on Order No. 11426-Phila-47-77.**

2 Trays PH-164-A, stainless steel, 14 by 17 inches; **1 Tray PH-164-A on Order No. 11426-Phila-47-77.**

* * * * * * *

12 Plates PH-152 or PH-152-A, ferrotype.

* * * * * * *

1 Siphon PH-244; **1 Siphon PH-244-A on Order No. 11426-Phila-47-77.**

* * * * * * *

1 Accessory Group consisting of—

2 Tongs PH-373-A, print, 8 inches; **2 tweezers, photographic, print, plastic, 6 inches, on Order No. 11426-Phila-47-77.**

* * * * * * *

3. Printer

The projection printer * * * two enlarging lenses. The 2-inch lens, in conjunction with the short focal length condensers, is used to

enlarge from 35-mm negatives, and the 6-inch lens (**5½-inch lens on Order No. 11426–Phila–47–77**) for enlarging from 4- by 5-inch negatives. The printer is * * * battery power cord.

9. Trays

Four stainless steel trays, two 11 by 14 inches, and two 14 by 17 inches (**three trays 11 by 14 inches, and one tray 14 by 17 inches on Order No. 11426–Phila–47–77**), are provided for holding the developing, fixing, and wash solutions.

15. Accessories

To facilitate printing * * * accessories are provided. These include two 8-inch print tongs (**two 6-inch print tweezers on Order No. 11426–Phila–47–77**), one 16-ounce graduate, one thermometer, one print paddle, one 10-inch squeegee, and one stirring rod.

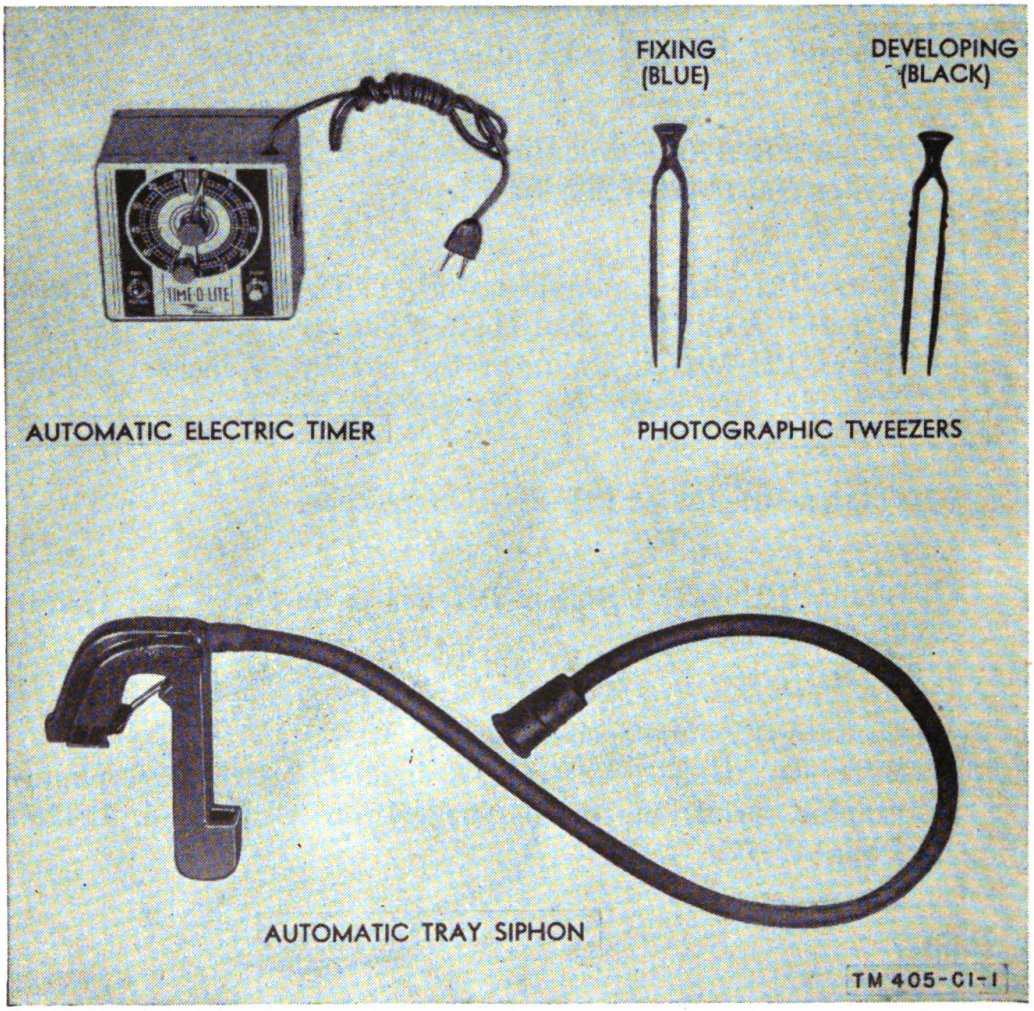

Figure 3.1 (added). Substitute components furnished with Processing Equipment PH–406 on Order No. 11426–Phila–47–77.

20. Developing Cut Film (Superseded)

Insert the film loading panels into the outermost grooves in the film tank. With the tank pouring spout to the left rear, place the film guide on the tank in such a manner that the indentations in the base of the guide fit over the rear projections on the tank light baffle. In the darkroom, insert the 4-inch width of an exposed 4- by 5-inch cut film into the slot in the center of the film guide. Grasp the projecting ends of the guide and gently pull the guide toward the front of the tank until the next projection of the tank light baffle is engaged in the depression in the base of the guide. Insert another exposed film. Continue in this manner until the capacity of the tank (12 films) is reached, then remove the film guide. Insert the film keeper into its two slots in the tank. Place the light trap, with the projections pointing upward, over the panels. *The circular cut-out in the light trap must be adjacent to the tank pouring spout.* Place the tank cover over the tank light baffle; then depress the cover into the groove between the outer surface of the tank and the light baffle. Set the timer to the desired development time, pour the developer into the tank through the hole in the center of the cover, and then gently rock the tank until the timer indicates that the desired development time has elapsed. Pour the developing solution from the tank.

23. Positive Developing Solutions

* * * * * * *

b. EMPLOYMENT (Superseded). Fill one of the 11- by 14-inch trays with the developer solution to a depth of about 2 inches. Fill the other 11- by 14-inch tray with a short-stop solution to a similar depth. Fill a 14- by 17-inch tray, or on Order No. 11426–Phila–47–77, fill the remaining 11- by 14-inch tray, with the fixer solution. Use the remaining 14- by 17-inch tray as the wash tray and attach the siphon to it. The fixer and wash trays should be well filled to insure proper immersion of large numbers of prints. When arranging the trays in a darkroom, use a standard system to facilitate identification of different solutions. One system is to arrange the trays in the following order from left to right: developer, short-stop, fixer, and wash. Care should be taken to keep the trays separated so that accidental splashing will not contaminate the solutions.

26. Projection Printer

* * * * * * *

c. OPTICAL SYSTEM. The optical system * * * the enlarging lens.

* * * * * * *

(3) *Enlarging lenses.* The printer is * * * different focal lengths. The 2-inch, f/4.5 lens is mounted on a flat lens board, and the 6-inch **(5½-inch on Order No. 11426–Phila–47–77),** f/4.5 lens is mounted on a lens cone. Both lenses are * * * of the opening.

* * * * * * *

30. Trays

Four stainless steel trays, two 11 by 14 inches, and two 14 by 17 inches **(three trays 11 by 14 inches and one tray 14 by 17 inches on Order No. 11426–Phila–47–77),** are provided for holding the various developing, rinsing, fixing, and washing solutions. The trays are * * * and corrosion resistant.

40.1 Weatherproofing (Added)

Signal Corps equipment, when operated under the severe climatic conditions which prevail in the tropic, arctic, or desert regions, requires special treatment and maintenance.

a. TROPICALIZATION. (1) *General.* Because fungus growth, insects, corrosion, salt spray, and excessive moisture affect most materials harmfully, a special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. Refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing and the supplies and equipment required in this treatment. The following problems may be encountered:

(*a*) Transformer windings, etc., fail because of the effects of fungus growth and excessive moisture.

(*b*) Electrolytic action, often visible in the form of corrosion, takes place in transformer windings, etc., causing eventual break-down.

(*c*) Hook-up wire insulation and cable insulation break down. Fungus growth accelerates deterioration.

(*d*) Moisture forms electrical paths on terminal boards and insulating strips, causing flash-overs.

Caution: Varnish spray may have poisonous effects if inhaled. To avoid inhaling spray, use a respirator if available; otherwise fasten cheesecloth or other cloth material over nose and mouth. Never spray varnish or lacquer near an open flame. Do not smoke in a room where varnish or lacquer is being sprayed; the spray may be highly explosive.

(2) *Treating Processing Equipment PH–406.* The equipment procured on Order No. 11426–Phila–47–77 is treated for moistureproofing and fungiproofing during manufacture and no further treatment is

necessary by maintenance personnel. Earlier equipments should be treated in accordance with directions in TB SIG 13 mentioned in (1) above.

(3) *Moistureproofing and fungiproofing after repairs.* If the coating of protective varnish has been punctured or broken during repair and if a complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

b. WINTERIZATION. For operational purposes, this equipment must be used in a heated room during cold weather. Refer to TB SIG 66, Winter Maintenance of Signal Equipment, for complete information. When the equipment has been stored under extreme cold conditions, to eliminate possible condensation of water in the equipment the following procedure is recommended before operating the equipment at room temperature:

(1) Transfer the equipment from the cold to the room temperature, and then allow it to remain in the room temperature for approximately 6 hours before removing the equipment from its packing boxes. Before operating the equipment, clean dry with a lint-free cloth any water that has condensed on the outside surfaces of the equipment. Clean the lenses with lens-cleaning tissue. When moisture has condensed on the inside surfaces of the lenses, do not operate the printer; the moisture on the lens surface will distort the printed image of the negative. To evaporate the moisture, leave the lenses at room temperature until the lenses clear. To accelerate this process, the lenses may be kept at a temperature not to exceed 120° F. until the water evaporates from the surfaces of the lenses.

(2) If possible, inclose the equipment in its packing boxes in a water-repellent material such as waterproof bags, shelter cloth, or other improvised coverings when the equipment is stored in a cold atmosphere.

c. DUSTPROOFING. This equipment requires no special dustproofing procedures since it is used in a photographic darkroom. However, when the equipment has been stored outdoors, the equipment may come in contact with dirt, dust, or sand. These abrasive materials do great damage if not cleaned away from the equipment. The cleaning must be done indoors or under cover. With a camel's-hair brush, clean out all foreign matter. The projection lenses must also be dusted with a camel's-hair brush before cleaning them with a lens-cleaning tissue. Avoid storing equipment outdoors. When outdoor storage is necessary, inclose the equipment in its packing boxes and if possible cover the packing boxes with shelter cloth or other improvised material to protect it further from the elements.

Section V—Rescinded

APPENDIX I (Added)

IDENTIFICATION TABLE OF REPLACEABLE PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the part. Requisitions must cite an authorized basis, such as T/O&E, TE, TA, T/BA, SIG 6, SIG 7&8, SIG 7–8–10, SIG 10, list of allowances of expendable material, or another authorized supply basis. For an index of available catalog pamphlets in the signal portion of the Army Supply Catalog, see the latest issue of the Army Supply Catalog SIG 1.

1. Identification Table of Replaceable Parts for Processing Equipment PH–406

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	PROCESSING EQUIPMENT PH–406: incl Printer PH–129–A and all photographic darkroom accessories necessary to process negatives and prints from 35 mm to 4″ x 5″; packed in two cases ea 38″ lg x 13½″ wd x 20″ h.	----------	8A3/53
	CABLE ASSEMBLY, power: UL type POS J–64 cable; 2 #18 AWG stranded cond; 25 ft lg excl term; Hubbell #9972 male connector on one end, std cord cube tap on other end; Simmon Bros part #235–001.	Used as extension cord.	3E4062–2
	CABLE, power: UL type SJ; two #18 AWG stranded cond; 300 v working.	Replacement cable for cable assembly.	1B818.14
	CONNECTOR, plug: 2 flat parallel male cont; straight; 1½″ diam x 1⅜″ lg overall; 15 amp 125 v, 10 amp 250 v; cylindrical rubber body w/ finger grip; Bryant Elec #HRD.	Terminates cable assembly.	6Z1736

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	CONNECTOR, plug: 3 parallel female cont; straight; 1 5/16" lg x 1 5/16" wd x 1 1/8" thk; 15 amp 125 v, 10 amp 250 v; cube-shaped bakelite body; cable opening 1/4" x 9/32; Bryant Elec #H-18.	Terminates cable assembly.	6Z7571-2
	CONNECTOR, adapter: cube tap one side male, three sides female; 1 pr flat parallel male cont, 3 pr parallel female cont; adapts single connector to accom 3 plugs; 1 5/16" lg x 1 5/16" wd x 1 1/8" thk less cont; 15 amp 125 v, 10 amp 250 v; cube-shaped bakelite body; Bryant #H-17.	Used in place of extension cord to accommodate three plugs.	6Z7571-1
	PLATE PH-152: ferrotype; brass or copper triple chrome pl; 14" lg x 20" wd.	Used to put glossy finish on prints.	8A2952.2
	GRADUATE PH-11: glass; beaker shape; 16 oz max cap; 3 3/8" diam x 6" h; graduated in 1 oz units from 0-16 oz.	Used for measuring purposes in preparing various solutions.	8A1411
	PADDLE PH-80: photographic print; hard rubber; 12" lg x 1/4" diam overall; hook at one end; 2" diam loop at other end.	Used to assist in handling of prints in various solutions.	8A2800
	PRINTER PH-129-A: picture; enlarger; accom 4" x 5" film or smaller; aluminum and steel w/varnished wood baseboard; 27" lg x 18" wd x 51" h; 5 1/2" or 139 mm f/lg lens and 2" or 48 mm f/lg lens; manual operation; double condenser lenses; 110 v 50-60 cyc AC or 6-8 v DC; alternate condenser lenses f/35 mm operation, base modified to facilitate packing (for replaceable parts see TM 11-2339).	Projects light image of negative.	8A1052-129A
	ROD PH-230: stirring; hard rubber; 10" lg x 1/4" diam.	Used to stir solutions.	8A3430

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	LAMP PH–422: hanging housing type; incl 3 removable safelight filters, one series OA amber-green 5½″ diam, one series 2, red, 5½″ diam and one series 3 green 5½″ diam; 8½″ lg x 6″ diam overall; steel housing; med screw base lampholder; uses 110 v, 10 w or 6 v, 10 w lamp; incl 10 ft cable w/switch (for replaceable parts see par. 3).	Provides darkroom illumination.	8A2151–422
	SIPHON PH–244 or PH–244–A: hard rubber or plastic; approx 7″ lg x 5″ wd x 1¼″ thk; incl 3 ft of rubber hose w/faucet fitting (for replaceable parts see par. 4).	Injects fresh water into and siphons contaminated water out of print tray.	8A3688
	SQUEEGEE PH–348: blade type; ⅞″ thk x 10″ lg; 2½″ h overall; rubber blade vulcanized into handle.	Removes excess water from prints.	8A3695–348
	TANK PH–186: accom 5½ ft of 35 mm film; plastic and stainless steel; 5″ OD x 3″ h overall; reel incl (for replaceable parts see par. 5).	Developing tank for roll film.	8A3727–186
	TANK PH–256–A: accom twelve 4″ x 5″ or smaller sheets of cut film or film pack; molded bakelite; 5¼″ sq x 7″ h overall (for replaceable parts see par. 6).	Developing tank for cut film.	8A3727–256A
	THERMOMETER PH–28: tank and tray; mercury thermal element; +20° F to +120° F; metal back; 4⅞″ lg x 1 5/16″ wd x ¼″ thk overall.	Used to determine solution temperature.	8A3828
	TIMER PH–29: photographic; metal w/glass over dial face; 5½″ h x 5″ wd x 2¼″ d.	Gives indication of interval of time.	8A3829

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	TIMER PH–426 or PH–426–A: direct reading; circular dial calibrated 0–60 sec along outer edge for 360°, w/manually set pointer; operates from 105–135 v, 60 cyc line; 105–135 v, 60 cyc, 6 amp single circuit control, one outlet (PH–426: 5½″ sq x 3½″ h overall; metal case, black wrinkle finish) (PH–426–A: 5″ sq x 3″ h overall; metal case, silver gray finish; incl single bell) (for replaceable parts see par. 7).	Automatically times length of exposures.	8A3830–426
	TONGS PH–373: stainless steel; 8″ lg.	Used to hold printer in various solutions.	8A3843
	TRAY PH–161–A: stainless steel; 14″ lg x 11″ wd x 2½″ d.	Solution container	8A3911
	TRAY PH–164–A: stainless steel; 17″ lg x 14″ wd x 2½″ d.	Solution container	8A3914A

2. Identification Table of Replaceable Parts for Lamp PH–422

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	LAMP PH–422: hanging housing type; incl 3 removable safelight filters, one series OA amber-green 5½″ diam, one series 2 red 5½″ diam, one series 3 green 5½″ diam; 8½″ lg x 6″ diam overall, steel housing; med screw base lampholder; uses 110 v, 10 w or 6 v, 10 w lamp; incl 10 ft cable w/switch.	Provides darkroom illumination.	8A2151–422

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	CABLE ASSEMBLY, power: two #18 AWG stranded cond; 10 ft lg excl term; lampholder GE #2705 on one end, Bryant #HRD connector on other end, Hubbell #275 feed-thru switch 1 ft from lampholder; Simmon Bros part #FS–10.	Connects safelight to power supply.	8A844.1
	CABLE, power: UL type SJ; two #18 AWG stranded cond; 300 v working.	Connects safelight to connector plug.	1B818.14
	CONNECTOR, plug: 2 flat parallel male cont; straight; 1½″ diam x 1⅜″ lg overall; 15 amp 125 v, 10 amp 250 v; cylindrical rubber body w/ finger grip; Bryant Elec #HRD.	Connects cable assembly to power source.	6Z1736
	LAMPHOLDER: medium screw; plastic shell body; 250 v, 660 w; 1 9/16″ diam x 2¾″ lg overall; mtd to cable end; GE #2705 body w/GE #2702 cap.	Connects safelight to cable assembly.	2Z5884–86
	SWITCH, toggle; SPST; 5 amp 250 v, 10 amp 125 v; bakelite body; 2½″ lg x 1″ wd x 13/16″ h; ⅜″ diam cord holes; Hubbell #275.	Used to turn safelight on and off.	3Z9694–1.2
	FILTER, light: greenish-amber; paper between colored glass; unmounted; 5½″ diam bound w/rubber edging; Wratten #OA.	Filters light	8A3504–OA
	FILTER, light: red; paper between colored glass; unmounted; 5½″ diam; bound w/rubber edging; Wratten #2.	Filters light	8A3504–2
	FILTER, light: green; paper between colored glass; unmounted; 5½″ diam; bound w/rubber edging; Wratten #3.	Filters light	8A3504–3
	LAMP, incandescent: 6 v, 10 w; bulb S–14 clear; 3¼″ lg over-all; med screw base; C–6 tungsten fil; Mazda #10S14.	Source of illumination, 6-v power supply.	8E91

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	LAMP, incandescent: 115 v, 10 w; bulb S–14 inside frosted; 3¼″ lg over-all; med screw base; C–9 tungsten fil; Mazda #10S14/1F.	Source of illumination, 110-v power supply.	8E94
	LAMPHOLDER: med screw; bakelite body; 250 v, 660 w; 1¼″ OD x 2$\frac{5}{16}$″ lg over-all; flange mtd; terminated in med screw base plug, incl mtg flange; Eagle Elec Cat. #1054.	Holds lamp	2Z5884–87
	RING, retainer: tenite; 6″ OD x 5⅛″ ID x 1$\frac{3}{16}$″ thk over-all; EKCo model A safelight ring.	Holds filter to safelight housing.	8A3373–1

3. Identification Table of Replaceable Parts for Siphons PH–244 and PH–244–A

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	SIPHON PH–244 or PH–244–A: hard rubber or plastic; approx 7″ lg x 5″ wd x 1¼″ thk; incl 3 ft rubber hose w/faucet fitting.	Injects fresh water into and siphons contaminated water out of print tray.	8A3688
	HOSE ASSEMBLY: rubber; ⅜″ ID x ⅝″ OD x 3 ft lg; EKCo #93415, ¾″ ID brass and rubber hose fitting at one end; EKCo #95414 w/ fitting #95415.	Connects siphon to water source.	8A1770
	STRAINER: brass, punched holes; bent into hollow cylinder; 1½″ lg x 1¼″ diam (for PH–244 only).	Removes foreign matter.	8A3688/S1
	WEDGE, clamp: rubber; octagonal; 1″ lg sides x ½″ thk (for PH–244 only).	Clamps siphon to tray.	8A3688/N1
	CLIP: siphon mtg; steel and rubber; 1¾″ lg x 1¾″ wd x ⅛″ thk; EKCo #97198 (for PH–244–A only).	Clamps siphon to tray.	8A826–1

4. Identification Table of Replaceable Parts for Tank PH–186

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	TANK PH–186: accom 5½ ft of 35 mm film; plastic and stainless steel; reel incl.	Developing tank for roll film.	8A3727–186
	AGITATOR, developing tank: red plastic; 6″ lg x 5/16″ sq; Burke & James #SCPC–B&J–609.	Used to agitate solution.	8A3727–186/1
	CAP: black bakelite; 2″ OD x ¾″ h overall; Burke & James #SCPC–B&J–603.	Covers funnel	6Z1723
	COVER: developing tank; black bakelite; 5¼″ OD x 1⅜″ h overall; Burke & James #SCPC–B&J–604.	Prevents light from entering tank.	8A3727–186/C1
	FLANGE, film: lower w/short hub; black bakelite; 4¾″ OD x ⅝″ thk overall; 11/16″–18 thd hole in cntr; Burke & James #SCPC–B&J–605.	Holds film in conjunction with upper flange.	8A3727–186/F1
	FLANGE, film: upper w/long hub; black bakelite; 4¾″ OD x ⅞″ ID x 1¼″ h overall; spiral groove f/loading film, hub-keyed to engage lower flange; Burke & James #SCPC–B&J–606.	Holds film in conjunction with lower flange.	8A3727–186/F2
	SCREW, thumb: fluted head; black bakelite; 11/16″–18; 1¼″ lg; 5/16″ thd lg; hollow point; head 1⅝″ OD x 5/16″ thk; shoulder ⅞″ OD x 15/16″ lg; hollow center; Burke & James #SCPC–B&J–607.	Secures lower film flange to upper film flange hub.	8A3727–186/S1

5. Identification Table of Replaceable Parts for Tank PH–256–A

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	TANK PH–256–A: accom twelve 4″ x 5″ or smaller sheets of cut film or film pack; molded bakelite; 5¼″ sq x 7″ h overall.	Developing tank for cut film.	8A3727–256–A
	COVER: developing tank; black bakelite; 5″ sq x 1⅝″ h overall; air vent in corner, funnel-shaped center w/¾″ diam hole; Fink-Roselieve part #122.	Prevents light from entering tank.	8A3727–256A/C2
	GUIDE, film: bar type; black bakelite; 6⅝″ lg x ⅞″ wd x ½″ h overall; ⅛″ wd x 4″ lg slot in cntr f/guiding film; Fink-Roselieve #126.	Guides film into individual panel slots.	8A3727–256A/G1
	KEEPER: black bakelite; 4½″ lg x 1″ wd x 1⅝″ h overall; grip lug at center, ends bent at 90°; Fink-Roselieve #127.	Keeps film in place during development.	8A3727–256A/B1
	PANEL: film loading, right-hand; black bakelite; 5½″ lg x 4½″ wd x ½″ thk; marked R on ribbed side; Fink-Roselieve #124.	Holds film in conjunction with left-hand panel.	8A3727–256A/P1
	PANEL: film loading, left-hand; black bakelite; 5½″ lg x 4½″ wd x ½″ thk; marked L on ribbed side; Fink-Roselieve #125.	Holds film in conjunction with right-hand panel.	8A3727–256A/P2
	TRAP, light: developing tank; black bakelite; 4½″ sq x ¾″ thk overall; air vent in corner, spout in other corner; Fink-Roselieve part #123.	Keeps light from striking film. Spreads solution as it is poured into tank.	8A3727–256A/C1

6. Identification Table of Replaceable Parts for Timers PH–426 and PH–426–A

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	TIMER PH–426 or PH–426–A: direct reading; circular dial calibrated 0–60 sec along outer edge for 360°, w/manually set pointer; operates from 105–135 v, 60 cyc lines; 105–135 v, 60 cyc, 6 amp single circuit control, one outlet (PH–426: 5½″ sq x 3½″ h overall; metal case, black wrinkle finish) (PH–426–A: 5″ sq x 3″ h overall; metal case, silver gray finish; incl signal bell).	Automatically times length of exposures.	8A3830–426
	CABLE, power: UL type SJ; two #18 AWG stranded cond; 300 v working.	Connects timer to plug connector.	1B818.14
	CONNECTOR, plug: 2 flat parallel male blade cont; straight; 1¼″ diam x 1⅜″ lg less cont; 10 amp 250 v, 15 amp 125 v; round rubber body w/cylindrical finger grip; Bryant Elec #HRA.	Connects timer cable to power source.	6Z7565
	CONNECTOR, receptacle: 2 rectangular female cont; straight; 1¼″ diam x ½″ thk; 10 amp 250 v, 15 amp 125 v; round phenolic body; w/mtg plate w/slots to accom 1½″ to 1⅞ mtg/c; and retainer ring; Amphenol #61–F1.	Timer receptacle connector. Receives printer power cord.	6Z7784–1
	KNOB: pointer; black bakelite; for ¼″ diam shaft; single #8–32 setscrew; single hairline; 2¼″ lg x 1⅜₁₆″ wd x ⅝″ h; brass insert; shaft hole ⅜″ d; Kurz-Kasch #S–464–15GH.	Facilitates turning of pointer and indicates amount of time.	2Z5748.6
	SWITCH, push: SPST; 0.25 amp 250 v, 0.75 amp 125 v; bakelite body; 1¾″ x 2³²⁄₃₂″ diam overall; momentary action; solder lug term; 1⁵⁄₃₂″–32 thd mtg bushing x 5⁄₁₆″ lg; key slot along lg of bushing; C–H #8410–K7.	Starts the timer	3Z9824–50.4

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	SWITCH, toggle: SPST; 3 amp 250 v, 6 amp 125 v; molded bakelite; 1 3/32" lg x 43/64" wd x 1 1/16" h; 15/32"–32 thd mtg bushing x 15/32" lg; C–H #8381K3.	Allows printer lamp to be used continuously or to be turned off automatically by the timer.	3Z9849.171
	RESISTOR, fixed: WW; 100 ohms ±5%; 10 w; 1¾" lg x 17/32" max diam; vitreous enamel; solder lug term; Ohmite type #BD (for PH–426 only).	Prevents overload on power line.	3Z4900.8

[AG 300.7 (24 Sep 48)]

BY ORDER OF THE SECRETARY OF THE ARMY:

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For explanation of distribution formula see TM 38–405.

U. S. GOVERNMENT PRINTING OFFICE: 1948

TECHNICAL MANUAL
No. 11-405

WAR DEPARTMENT,
WASHINGTON, May 12, 1943.

PHOTOGRAPHIC DARKROOM EQUIPMENT

(PROCESSING EQUIPMENT PH-406)

523653°—43——1

SECTION I

DESCRIPTION

1. Purpose.—Processing equipment PH–406 is designed to furnish complete facilities for developing 35-mm roll film (5½-foot lengths), and 4- by 5-inch negatives, and for processing projection prints from these negatives.

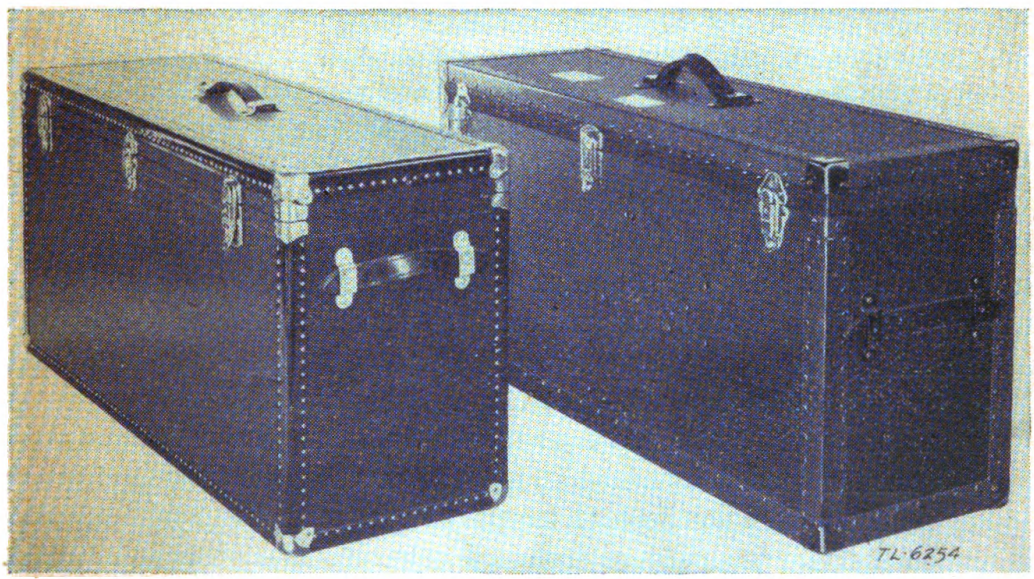

FIGURE 1.—Processing equipment PH–406 packed ready for transporting.

2. Components.—The components of processing equipment PH–406 are:

1 Printer PH–129–A, with 6-inch or 5½-inch f/4.5 lenses and 2-inch f/4.5 lenses.
1 Timer PH–426, automatic, electric.
1 Lamp PH–422, darkroom (commonly known as a safelight).

1 Foot switch PH–424.
1 Timer PH–29.
2 Trays PH–161–A, stainless steel, 11 by 14 inches.
2 Trays PH–164–A, stainless steel, 14 by 17 inches.
1 Paper board PH–317.
1 Plate PH–152 or PH–152–A, ferrotype.
1 Tank PH–256–A, cut film, for 4- by 5-inch film.
1 Tank PH–186, for 35-mm roll film (5½-foot lengths).
1 Siphon PH–244.
1 Power cord, 10½ feet.
1 Power cord, battery.
1 Power cord, adapter.
1 Accessory group consisting of—
    2 Tongs PH–373–A, print, 8 inches.
    1 Squeegee PH–348, 10 inches.
    1 Graduate PH–11, 16 ounces.
    1 Thermometer PH–28.
    1 Paddle PH–80, print.
    1 Rod PH–230, stirring.
2 carrying cases.

NOTE.—*Case 1* provides space for packing baseboard, safelight, foot switch, trays, tanks, paper board, siphon and accessory group. This case is 40 inches long, 19 inches high, and 13½ inches deep, and weighs 111 pounds, packed.

Case 2 provides packing space for printer, lamp housing, lens filters, lenses, condensers, and lens board. This case has the same dimensions as case 1, and weighs 92 pounds, packed.

3. Printer.—The projection printer provides means for the enlargement of prints from 35-mm and 4- by 5-inch negatives. It is of standard condenser design and employs either one of two enlarging lenses. The 2-inch lens, in conjunction with the short focal length condensers, is used to enlarge from 35-mm negatives, and the 6-inch lens for enlarging from 4- by 5-inch negatives. The printer is mounted on a laminated baseboard with a double girder bar support for the printer head. Mounted on the base is a step-down transformer (60-cycle, 110 volt–6 volt) which supplies the printer lamp with 6 volts. When the printer is operated from a 6-volt vehicular storage battery, the lamp is connected directly to the battery through the foot switch and battery power cord.

4. Condensing lens.—Two sets of condensing lenses of different focal lengths are supplied for use with the 2-inch and 6-inch enlarging lenses.

5. Automatic timer.—This device is an electrically operated timer which governs exposure time on the printer. The exposure time, which

may be from 1 to 55 seconds, is controlled by moving the dial pointer to the figure indicating the desired time and operating the push-button switch mounted just below the dial. The timer operates only from a 110-volt, 60-cycle a-c power source.

6. Safelight.—A standard safelight (lamp PH–422) is provided for darkroom illumination. A red and yellow light filter transmits only light of a color that will not affect light-sensitive paper and negatives. Lamps are supplied for either 6- or 110-volt operation.

7. Foot switch.—A foot switch, which controls the printer lamp, is supplied for battery operation. Pressure on the switch causes the printer lamp to light and remain lighted until the pressure is released.

8. Timer.—This device is a spring motor timer which automatically gives a warning signal when development is completed, from 1 to 60 minutes. Developing time is selected by moving the selector hand to the figure indicating the desired time. The timer is placed in operation by moving the sweep hand to the zero position and releasing it. At the end of the time interval selected, a bell sounds to signal the operator.

9. Trays.—Four stainless steel trays, two 11 by 14 inches, and two 14 by 17 inches, are provided for holding the developing, fixing, and wash solutions.

10. Paper board.—The paper board is of all metal construction with adjustable masking blades. Paper up to 8 by 10 inches may be handled by this board.

11. Cut film tank.—The cut film tank is of plastic construction designed to hold 4- by 5-inch negatives for developing. The removable hanger holds the film in position, and developer is poured into the tank through a lightproof hole.

12. Roll film tank.—The roll film tank holds exposed 35-mm negatives (18- or 36-frame) for developing. The exposed negatives are wound on the spiral reel, the reel placed in the tank, and the lightproof cover attached. The various solutions are poured into the tank and drained from it through the lightproof hole in the cover.

13. Siphon.—A molded hard rubber automatic tray siphon converts an ordinary tray into an effective print washer. It puts fresh water in at the top of the tray, keeps prints agitated, and siphons out the chemically laden water. The force of the stream may be adjusted to keep the prints separated and in motion. The tray siphon can be attached to any water tap and can be adjusted to any tray.

14. Power cords.—Three power cords are furnished for connecting the printer and accessories to a 6- or 110-volt power source. The 110-volt power cord is a rubber-covered cable 10½ feet long, equipped at one end with a three-way receptacle. The printer, safelight, timer,

and other accessories receive power through this receptacle. The other end is attached to a standard plug to fit a power source receptacle. The 6-volt power cord is also equipped with a three-way receptacle for connection to the printer and accessories, and with battery clips for connection to battery terminals. A short adapter cord is provided to connect the printer lamp to the power cord receptacle when a battery supplies power.

15. Accessories.—To facilitate printing and developing, numerous small accessories are provided. These include two 8-inch print tongs, one 16-ounce graduate, one thermometer, one print paddle, one 10-inch squeegee, and one stirring rod.

Section II

EMPLOYMENT

16. Preliminary instructions.—A lightproof room or tent suitable for use as a darkroom should be prepared before the equipment is unpacked. Lightproofing may be accomplished by means of blankets, tarpaulins, canvas, or other opaque materials. The location chosen should have an adequate water supply and power source. Large quantities of water are needed for the washing of prints and negatives. A 110-volt, 60-cycle outlet or a 6-volt vehicular storage battery must be available as a source of power.

17. Unpacking and preparation for use.—*a. Unpacking.*—Processing equipment PH–406 should be carefully unpacked by performing the steps listed, following in the sequence given.

(1) Open both carrying cases by releasing the two-fast action fasteners and opening the trunk latch lock (see fig. 2).

(2) Remove the printer baseboard from case 1 and place in a suitable position on a table or bench in the darkroom previously prepared.

(3) Loosen the latches and straps and lift out the girder bar, printer assembly, and fiber box containing accessories from case 2.

(4) Remove the lamp housing assembly.

(5) Remove all components and accessories from their compartments in case 1.

b. Preparation for use.—To prepare processing equipment PH–406 for use, the following procedure and precautions must be observed:

(1) Place the girder bar support on the base, and screw the bakelite knobbed screw down tightly to hold the support firmly in position.

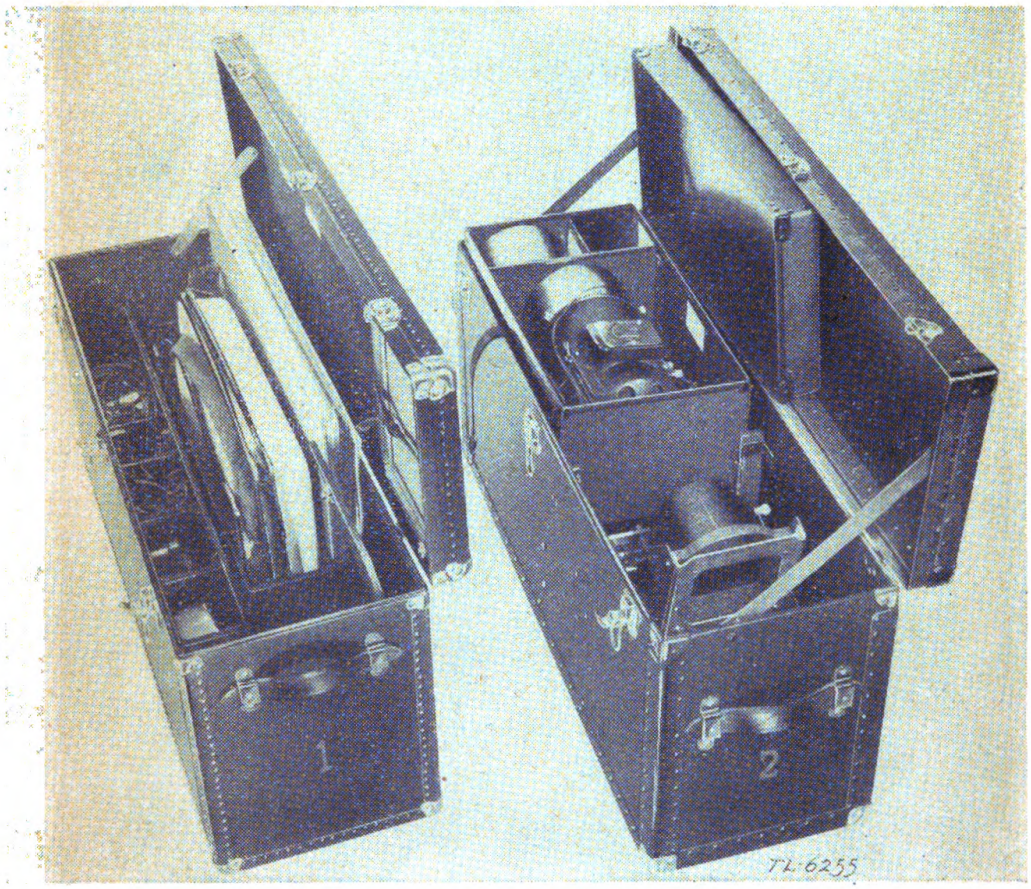

FIGURE 2.—Cases open ready for unpacking.

(2) Loosen the four knurled screws on the sides of the lamp house. Place the lamp house in position, alining the screws with the slots in the four lifting levers. Tighten the screws firmly when they are properly alined.

Caution: Do not unscrew printer head lock screw *C* (fig. 3), until the lamp house is in position. A spring-loaded reel counterbalances the printer head weight, and if the screw *C* is released before the lamp house is installed, the head will be unbalanced, and will slide upward, possibly damaging the printer.

(3) Install the lens cone by alining it with slots in the receiver and rotating.

(4) If the 2-inch lens is to be used, aline the lens board in the same manner and rotate to lock. Condensing lenses of short focal length must also be used with the 2-inch enlarging lens. To remove the condensers, loosen the two knurled screws and rotate the condenser

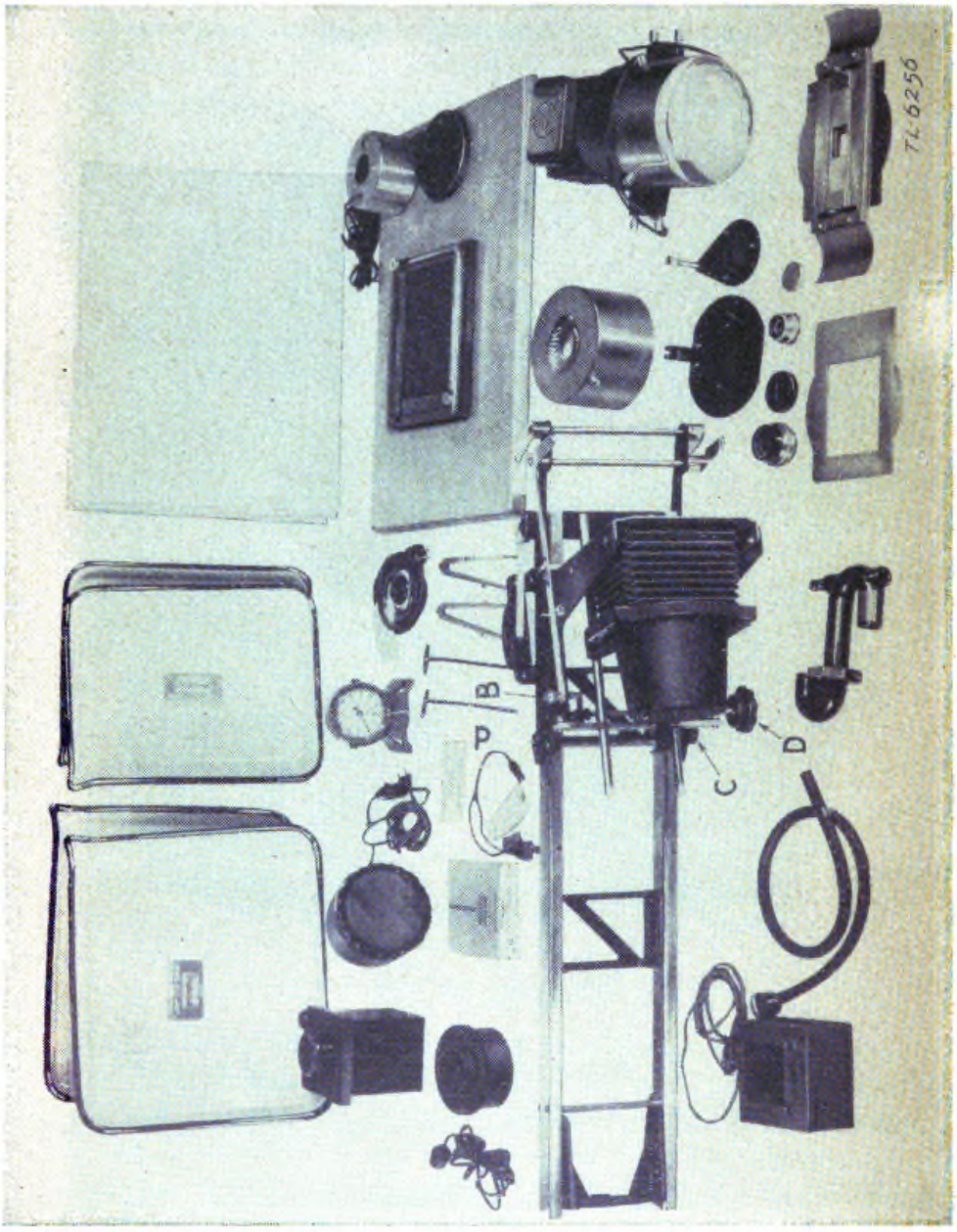

FIGURE 3.—Processing equipment PH–406 ready for assembly.

housing to the left. The condenser housing will then slip off the lamp house. Install short focal length condenser housing and tighten the screws.

(5) Place the film gate desired in position against the screwheads on the receiver, making certain that the dowels engage the holes in the gate.

(6) Arrange the tanks, safelight, timer, and other accessories in the most convenient location for the operator. It is good practice to place the developer and fixer trays on opposite sides of the printer so that they may be easily identified in the dimly lit darkroom.

18. Electrical connections.—*a.* The following procedure is followed for connecting the printer to a 110–volt, 60-cycle power source:

(1) Insert the plug of the power extension cord in the power source receptacle.

(2) Plug the safelight and the timer cords into the three-way receptacle on the end of the power cord.

(3) Plug the printer power cord into the receptacle on the side of the timer.

(4) Plug the midget connector of the printer lamp into the receptacle on the printer base.

b. The following procedure is followed for connecting the printer to a 6-volt vehicular battery:

(1) Connect the clips on the power cord to the battery terminals.

(2) Insert the safelight and foot switch plugs into the receptacle on the end of the power cord.

(3) Plug the power cord from the lamp housing into the midget receptacle on the end of the power cord.

(4) Plug the end of the adapter cable into the receptacle on the back of the foot switch plug.

Caution: Check voltage of safelight lamps and make certain that the correct lamp is provided for the voltage used.

19. Negative developing solutions.—The solutions used in developing, rinsing, and fixing are standard solutions made by dissolving prepared powders in water. In the preparation of these solutions, it is essential that the mixing instructions on the package be followed exactly. For the care, use, and preparation of solutions from raw chemicals, consult appendix I, TM 1–219.

20. Developing cut film.—Place the exposed 4- by 5-inch films in the grooves of the film hanger in total darkness or under the proper color safelight for the film used. Place the hanger in the tank, and attach the lightproof cover. Set the timer for the desired developing time, and pour the developer into the tank through the lightproof hole. Rock the tank back and forth several times to accelerate the developing action and to eliminate any air bells which might have formed on the surface of the emulsions. When the development time has expired, drain the developing solution from the tank.

21. Developing roll film.—To develop roll film, first remove the film cartridge from the camera. In the darkroom, disassemble the film cartridge and roll the exposed film onto the tank reel, with the emul-

sion side in. Place the reel containing the films in the tank and attach the cover. Pour the developing solution into the tank through the lightproof hole in the cover. Rock the tank back and forth several times to accelerate the developing action and to eliminate air bells. When the film has developed for the proper length of time, drain the developing solution from the tank.

22. Rinsing, fixing, and washing.—*a. Rinsing.*—When the development has been completed, drain the tank and circulate the rinse water among the negatives. The usual rinsing time is from 30 to 60 seconds.

b. Fixing.—After rinsing, drain the tank again and fill with the fixing bath. Rock the tank to start the fixing process and then allow to stand until fixation is complete. Fifteen minutes is normally sufficient for fixation.

c. Washing.—Drain the fixing solution and wash the negatives with running water for at least 20 minutes. Following this, remove the negatives from the hanger or reel and swab dry on both sides with a chamois skin or fine sponge. At this time the cover may be removed and light, other than darkroom light, may strike the negative.

23. Positive developing solutions.—*a. Preparation.*—The procedure outlined in paragraph 19 applies to the preparation of positive or proper developing solutions.

b. Employment.—Pour the developer solution into one of the two 11- by 14-inch trays to a depth of about 2 inches. Fill the two 14- by 17-inch trays to a similar depth with the fixer and rinse solutions. Place the trays apart at such a distance that there will be no danger of splashing one solution into the other. This can be accomplished by placing the developer and fixing solutions on opposite sides of the printer. Such an arrangement also makes it easier to identify the solutions in the darkroom. Since it is difficult to keep large prints separated when they are immersed in solutions, liberal quantities of solution should be placed in the trays.

24. Processing of prints.—The successful enlargement of prints with processing equipment PH–406 depends on the careful preparation of the negative, proper projection, and correct developing and fixing technique. Extreme care must be exercised in the handling of prints from the actual exposure to the finished print.

a. Inspection of printer.—Inspection of the printer should include the following:

(1) Checking the lens for cleanliness and determining if diaphragm is working properly.

(2) Checking the lights, switches, and movable parts of the printer.

(3) Testing the evenness of illumination with the negative removed from the carrier.

b. Composing print.—Insert the negative in the film holder with the emulsion (dull) side toward the lens. This is done by pulling

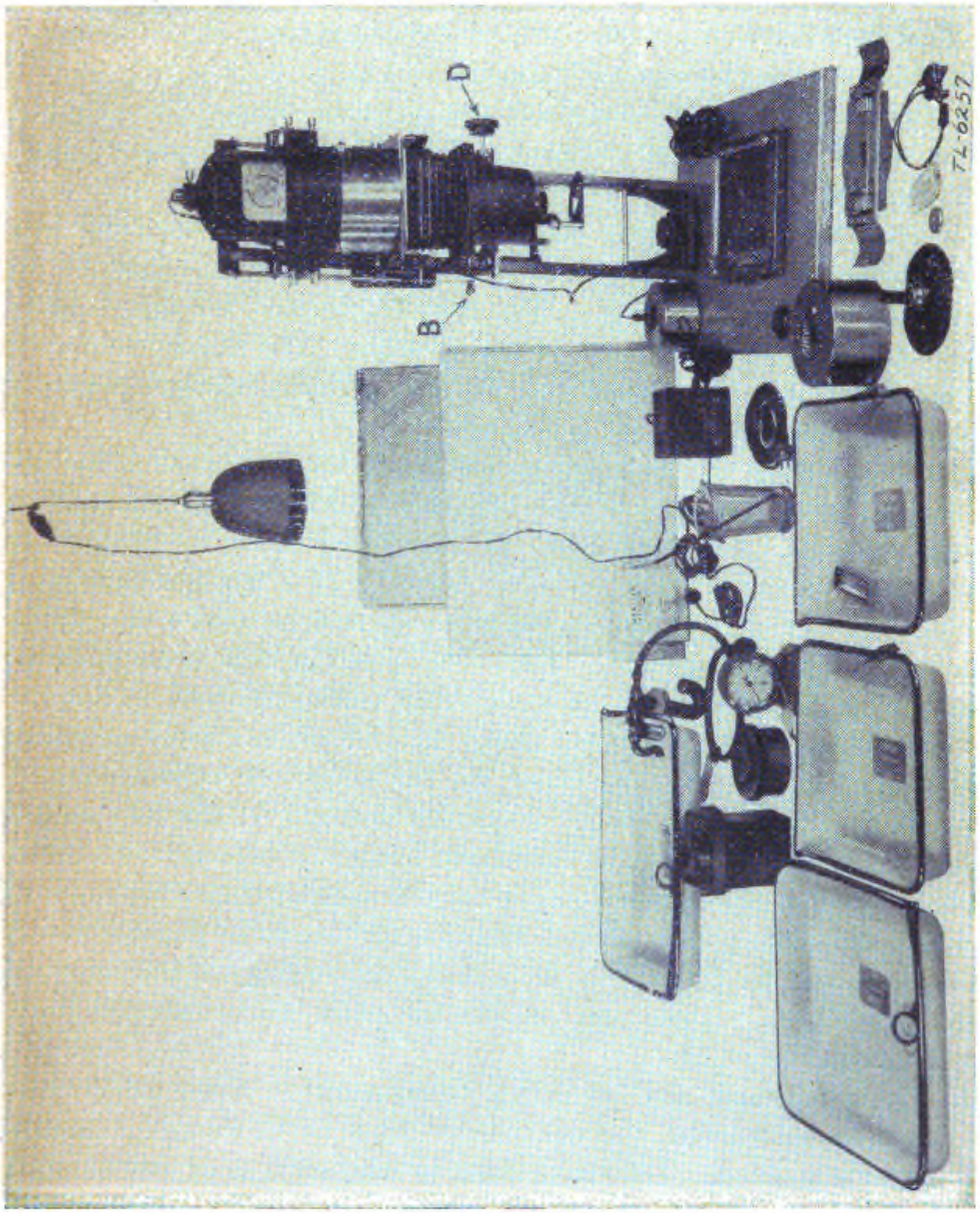

FIGURE 4.—Processing equipment PH–406 ready for use.

forward film gate release lever *B* (fig. 4), located just to the left of the lamp house. If the print is to include the entire area of the negative, the composing of the print is a matter of correct spacing of the image on the paper board. To accomplish this, loosen the bakelite printer head lock screw *C*, located on the side of the printer head

bracket, and slide the entire printer head vertically along the guide bars until the correct image size is obtained. Open the lens wide and focus it by rotating focusing knob *D* (fig. 4), located just to the right of the lens. Frequently it is not necessary to include the entire image of the negative in the print. In such cases it is often possible to improve the composition of the print by local masking of the image.

c. Test exposure.—To insure proper exposure time of the print, it is usually best to perform a test exposure. This is done as follows:

(1) Open the lens wide and study the projected image for contrast. The degree of contrast will determine the contrast of the paper which should be used.

(2) Turn the printer lamp on and close the diaphragm of the lens until the image appears to have a brightness that will require an exposure of at least 10 seconds. The diaphragm has clicking stops to make it easier to judge the size of the opening. The ability to decide when an image has the desired degree of brightness requires practice, but is an excellent way to judge exposures.

(3) Place a strip of test paper on the paper board in such a manner that it will cover an area of the negative which is uniform and of average density. Set the timer for exposures of 4, 8, 12, and 16 seconds, and expose a strip for each period. If a storage battery is supplying power to the printer, the timer cannot be used and must be replaced by the foot switch. Exposure time, in this case, must be estimated by use of a watch or some other timing device.

d. Exposing print.—Turn the lamp off and place a piece of paper on the paper board. Set the timer for the length of exposure determined by the test, and push the operating button. If the foot switch is used, apply pressure for the estimated length of exposure, and then release. Develop the exposed paper for the normal time (1½ minutes for bromochloride papers and 2 minutes for bromide papers), rinse thoroughly, and fix from 3 to 10 minutes depending on the strength of fixing solution. Rinse and inspect the print under normal light. Dry and trim the print.

25. Dismounting and packing equipment.—After all processing has been completed, the equipment must be thoroughly cleaned and properly packed. The trays must be washed free of any solution and wiped dry. Disconnect the electrical connections and place each item in its traveling position (fig. 2), making certain that all straps and brackets are tight. Failure to take these precautions will result usually in damage to the equipment during transport.

SECTION III

FUNCTIONING OF PARTS

26. Projection printer.—*a. Base and girder support.*—The printer is mounted on an 18- by 27-inch laminated baseboard. Mounted on this baseboard is a base casting and a step-down transformer (60-cycle, 110 volt-6 volt) which supplies 6 volts to the lamp. The girder support is fastened to the base casting by means of a bakelite knobbed screw. The transformer cover has a power outlet receptacle for the 6-volt supply to the lamp. The 110-volt power cord of the transformer passes through a hole in the base of the casting.

b. Printer head base.—The printer head base consists of two steel stampings, to which are fastened the bellows, film gate, film gate receiver, lens focusing mechanism, and levers for attaching the lamp house and the condenser assembly. The adjustment knob *D* (fig. 4) moves the lens vertically along the guide bars by means of a friction drive. In this way, the lens is focused. A positive lock set screw for clamping the printer head in any desired position is located on the side of the left frame. The film gates are of pressed steel construction, and are equipped with internal springs that automatically open the gate when the film gate release lever is operated. The operation of this lever relieves the gate of the weight of the lamp house, and makes it easy to insert the negative in the gate. A spring loaded reel mounted on the printer head base, with the end of the tape fastened to the top of the girder, counterbalances the weight of the printer head. This reduces to a minimum the effort required of the operator in moving the printer head for print size selection. A red filter for use with bromide paper is mounted just below the lens on a swivel mount.

c. Optical system.—The optical system consists of a lamp, two condensing lenses, and the enlarging lens.

(1) *Lamp.*—The printer is supplied with a lamp S–14 which operates on 6 to 8 volts. This 32-candlepower lamp has a double-contact base and its glass bulb is of the shaded opal type. The lamp housing is of cast construction with integral cooling fins for cool operation. The lamp is accessible for replacement when the condensers are removed.

(2) *Condensing lenses.*—Two sets of condensing lenses are supplied for the enlarging lenses of two different focal lengths. A set of condensing lenses of *short* focal length is used in conjunction with the 2-inch, f/4.5 lens; and a set of condensing lenses of *long* focal length is used with the 6-inch, f/4.5 lens. In both cases, the two condensing lenses are mounted in a tubular housing just below the lamp house. The housing is held in position by two knurled screws located about its outer edge. The lenses are mounted with the curved surfaces facing each other and are separated by a corrugated spacer.

(3) *Enlarging lenses.*—The printer is supplied with two enlarging lenses of different focal lengths. The 2-inch, f/4.5 lens is mounted on a flat lens board, and the 6-inch, f/4.5 lens is mounted on a lens cone. Both lenses are of anastigmat quality and are provided with a micrometer adjustment for critical focusing. The diaphragms have clicking stops to make it easier to identify the size of the opening.

(4) *Mechanics of focusing.*—The size of the projected image depends on the distances between the negative, lens, and paper board, as well as on the focal length. The only variable factor that materially affects print size is the distance between the negative and the paper board. The lens adjustment changes the relation between negative and lens very slightly, and is used only for focusing purposes. The greater the distance between the printer head and the paper board, the larger the size of the projected image. (See fig. 5①.) Conversely, the shorter the distance between the two elements, the smaller the image (fig. 5②). For each selection of print size, the lens must be refocused.

27. Automatic timer.—The automatic timer is a self-contained electric timing device with an integral switch for printer control. The timer receives power from any 110-volt, 60-cycle power source through its power cord and plug. The printer power cord is connected to the timer through a receptacle on the side of the timer, and the time of exposure is governed by the position of the dial pointer on the face. The timer is placed in operation by turning the switch on the lower left-hand side of the panel to ON, and actuating the push switch on the lower right-hand side of the panel. The printer lamp is then lighted for the time indicator by the pointer,

and, at the end of this time, the printer lamp is automatically turned off.

28. Safelight.—The safelight consists of a power cord, lamp socket, lamp cover, and two sets of light filters. Lamps are supplied for both 6- and 110-volt operation. Two light filters, one red and one yellow, are used to provide light of the correct color for the various types of light-sensitive materials.

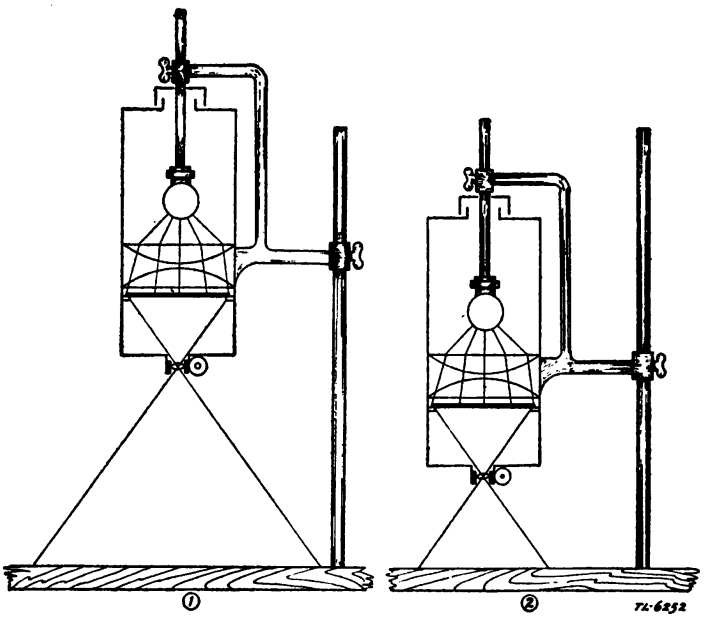

FIGURE 5.—Printer head location for print size selection.

29. Foot switch.—A pressure-operated switch is provided to control the printer lamp when a 6-volt power source is used. Pressure of the foot on the diaphragm closes the switching contacts, thus completing the lamp circuit.

30. Trays.—Four stainless steel trays, two 11 by 14 inches, and two 14 by 17 inches, are provided for holding the various developing, rinsing, fixing, and washing solutions. The trays are of pressed steel construction and are rust and corrosion resistant.

31. Paper board.—The paper board is of all-metal construction, with two adjustable masking blades for handling paper up to 8 by 10 inches. After the image has been properly composed and focused on the paper board, the sensitized paper is placed on the board with the marking blades holding it in position. The paper is then exposed, the blades lifted, and the paper removed, developed, and fixed in the usual way.

32. Cut film tank.—The cut film tank is of plastic construction, and is designed to hold 4- by 5-inch negatives for developing, rinsing, and fixing. The negatives are removed from the pack or holders, and

placed in the grooves of the hanger. The lightproof cover is placed in position and the developing solution poured through the hole. The loading of the hanger must be carried out in the darkroom. After the negatives have developed for the required length of time, the solution is drained and the films rinsed with running water. The fixing and wash solutions are then used in a similar manner.

33. Roll film tank.—The roll film tank holds 18 or 36 exposed 35-mm negatives for developing. The exposed negatives are wound on the spiral reel, the reel placed in the tank, and the lightproof cover attached. The various solutions are poured into the tank and drained from it through the lightproof hole in the cover.

34. Siphon.—The automatic tray siphon converts an ordinary tray into an effective print washer. The siphon is placed in position on the side of the tray and connected to the running water source by means of the rubber hose furnished.

35. Power cords.—Three power cords supply the printer power from either a 110-volt, 60-cycle power source, or a 6-volt vehicular battery. The 110-volt power cord is a rubber-covered cable, 10½ feet long, equipped at one end with a three-way receptacle. All accessories obtain power through this receptacle. The other end of the cable is attached to a plug to fit a power source receptacle. The 6-volt power cord is equipped with an identical three-way receptacle and battery clips for connecting to the battery terminals. The power cord from the lamp house is equipped with a midget plug and will not fit the three-way receptacle. An adapter cord with receptacle to fit this plug is used to connect the lamp to the power cable.

36. Accessories.—Various accessories are supplied to facilitate the handling and developing of films and prints.

a. Print tongs.—Print tongs are used for holding prints in the various solutions to prevent fingerprints and other discolorations.

b. Graduate.—The 16-ounce graduate is used for preparing the various solutions.

c. Thermometer.—The developing solution must be maintained at a predetermined temperature if the best results are to be obtained. The thermometer should be used at frequent intervals to check the temperature.

d. Print paddle.—The print paddle is used to assist in the handling of prints in the various solutions.

e. Squeegee.—The 10-inch squeegee is used to dry the prints that have passed through the various solutions.

Section IV

MAINTENANCE

37. Cleaning lenses.—For efficient projection, all lenses contained in the optical system must be kept free of dust and dirt. Lens tissue or soft, lintless cloth are used to remove any foreign matter from the lenses.

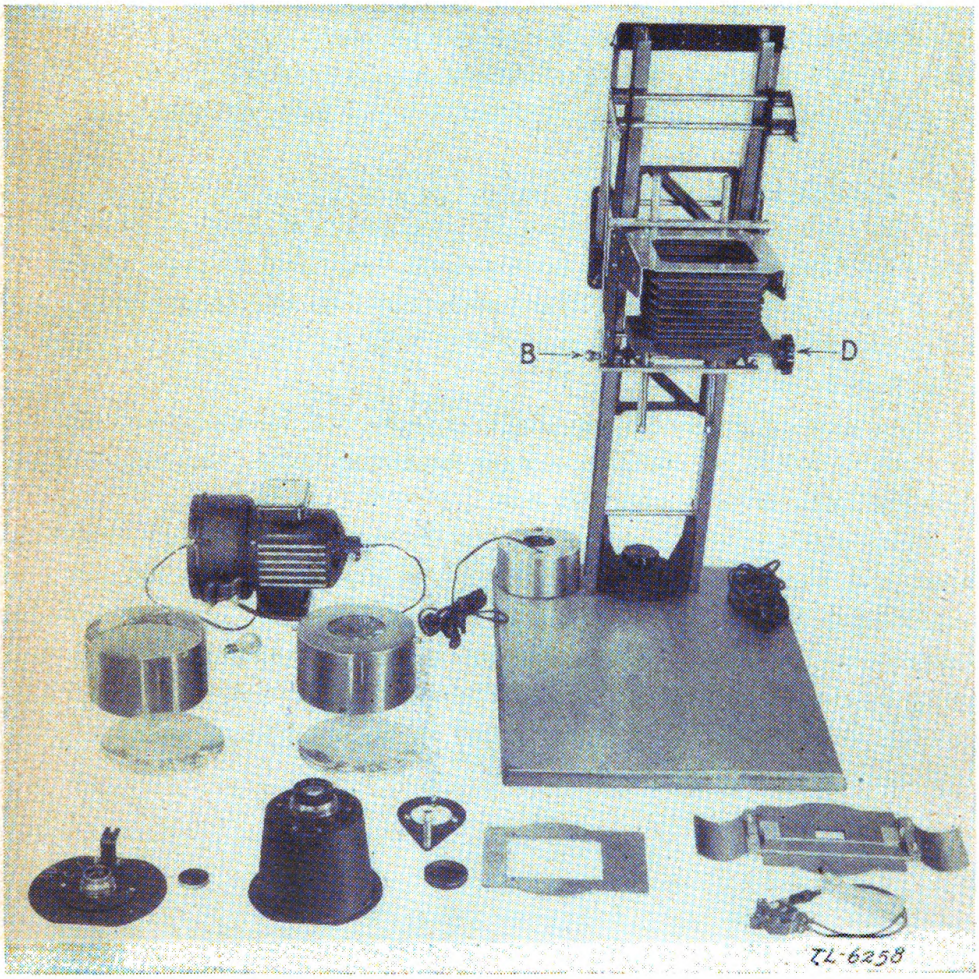

Figure 6.—Printer disassembled showing component parts.

a. Enlarging lenses.—The enlarging lenses can be cleaned without being removed from the lens board or printer.

b. Condensing lenses.—To clean the condensing lenses, remove the two knurled screws holding the condenser housing to the lamp house (fig. 6). Hold the condenser housing with the right hand, and pull

the film gate release lever forward. This frees the condenser housing from the lamp house. Remove the condensing lenses from the housing by pressing carefully on the bottom lens with the thumb, thus forcing out both lenses and the spacer. Clean the lenses and replace them in the housing. The curved surfaces of the two lenses will face each other when they are properly assembled in the housing. Slip the housing in position on the lamp house and replace the two screws.

38. Replacing lamp.—To replace the printer lamp, remove the condenser housing as explained in paragraph 37. The lamp is then accessible, and can be easily removed and replaced from the bottom of the lamp house. To remove the lamp, press up and turn left. Insert a new lamp, and replace the condenser housing.

39. Lubrication.—To facilitate movement of the printer head on the girder bars, occasionally spread a thin film of vaseline on the guides.

40. Precautions.—*a.* The lenses should never be dropped or allowed to collect moisture. Rough treatment of any of the printer parts will disturb the optical adjustment, resulting in poor prints.

b. For battery operation, the power cord to the transformer must be disconnected since the transformer will be damaged if connected to the 6-volt battery.

c. The safelight should be checked before it is connected to make sure that a lamp of correct voltage is being used. Lamps are supplied for both 6- and 110-volt use.

d. The automatic timer must not be used for battery operation. Damage to the timer will result if it is connected to the battery.

e. Do not loosen the locking screw until the lamp house has been fastened in position. The printer head is counterbalanced by a spring loaded reel, and loosening the lock screw with the lamp house removed will cause the printer head to slide upward suddenly, possibly damaging the printer.

SECTION V

SUPPLEMENTARY DATA

41. List of replaceable parts.

Signal Corps stock No.	Description	Manufacturer	Manufacturer's No.
8A1052–129A	Printer PH-129A complete, consisting of—		
	Casting, base	SBI	BC–406
	Screw and knob for base casting.	SBI	S–310–48–525
	Baseboard, wooden, 18″ x 27″ x 1″.	SBI	BBD–3–SC
	Gliders, 3-prong, for baseboard.	SBI	⅞–3
	Screws, iron machine, 12–24 x 1″.		
	Nuts, iron hex, 12–24.		
	Washers, iron, ¼″ o. d. .262″ i. d. x .051″.		
	Girder assembly	SBI	GA–2.
	Casting "U" attached to girder assembly.	SBI	3–302
	Spring, balance, complete.	SBI	14–F
	Projector assembly	SBI	GA–3
	Carriage	SBI	GA–4
	Mechanism, lifting	SBI	LM–406
	Knob, red, for lifting mechanism.	SBI	464–15–G
	Knob and screw, locking carriage.	SBI	S–308
	Screw, set, Allen 8–32 x 3/16″.		
	Wrench, Allen set screw, 8–32.*		
	Focusing movement	SBI	FM–1
	Knob and screw, focusing movement.	SBI	310–3
	Lens board and lens, 5½–6½″	SBI	GA–8
	Lens board, cup-shaped, 5½–6½″.	SBI	LB–65–45
	Disk, for lens board	SBI	211–85
	Lens, 5½″ f/4.5	SBI	LB–45–55
	Cap, lens, for 5½″ lens	SBI	LC–55

41. List of replaceable parts—Continued.

Signal Corps stock No.	Description	Manufacturer	Manufacturer's No.
	Printer PH–129A complete, consisting of—Continued.		
	Lens board and lens, 2″	SBI	GA–9
	Lens board, flat	SBI	LB–2
	Disk, for lens board	SBI	LD–2
	Lens, 2″ Omega f/4.5	SBI	L–45–2
	Cap, lens, for 2″ lens	SBI	LC–2
	Condenser assembly, 6½″	SBI	GA–6
	Condenser assembly 2½″	SBI	GA–7
	Condenser, glass, 6½″	SBI	C–65–10
	Condenser, glass; 2½″	SBI	C–35–5
	Screw, knurled, for condenser assembly.	SBI	251–164
	Filter assembly, red Safelite, complete.	SBI	RSLF
	Screw, knurled, for filter assembly.	SBI	251–1–C
	Bellows assembly	SBI	GA–10
	Bellows, artificial leather.	SBI	95–1
	Film holder, rapid shift, 35-mm.	SBI	RC–35
	Film holder, dustless, 4″ x 5″.	SBI	DFH–45
	Lamp housing	SBI	GA–5A–SC
	Electrical connector assembly, equipped with Edison std. screw male plug at one end and female midget plug on other end.	SBI	4988–7
	Socket, lamp, bayonet base, single contact.	SBI	4931–1
	Transformer, 110-v/6–8-v	AE&M	T–3216

*Not a part of assembly, but desirable for maintenance.

OTHER COMPONENTS

8A828	Connectors, battery, heavy duty, 2-conductor, 2 ft long, with female plug and 2 battery clips with sleeves.
8A844.1	Cord, extension, rubber-covered, 10½-ft with 110-v male plug, line switch and socket (for lamp PH–422).
8A845	Cord, extension, rubber-covered, 25-ft, 2-conductor, with 110-v male plug and cord cube tap.
8A2125	Lamp, Mazda, No. 115, 6–8 v 5-amp bayonet base single contact (enlarging lamp), opal, standard.

OTHER COMPONENTS—Continued

8A2098.2	Lamp, Mazda, No. S–14, 6–8 v, 10-w med. screw base, inside frosted (for lamp PH–422).
8A2098.1	Lamp, Mazda, No. OG10–S–14–Line–1F, 10-watt, 110-v, med. screw base, inside frosted (for lamp PH–422).
8A3830–426	Timer PH–426, automatic electric.
8A3911A	Tray PH–161–A, 11″ x 14″.
8A3914A	Tray PH–164–A, 14″ x 17″.
8A2151–422	Lamp PH–424, darkroom, hanging, complete with one 5½″ series OA Safelite glass.
8A1108–424	Foot switch PH–424.
8A3829	Timer PH–29, with tilting base, 2 hands (minute and second).
8A135–317	Board PH–317, metal paper-holding, 8″ x 10″, gray finish.
8A3727–256–A	Tank PH–256–A, daylight developing, for 12 4″ x 5″ cut or pack films or smaller, adjustable.
8A3727–186	Tank PH–186, developing, 35-mm roll film, Watson.
8A3688	Siphon PH–244, automatic tray.
8A3843A	Tongs PH–373–A, print.
8A1411	Graduate PH–11, visible, 16-oz.
	Squeegee PH–348.
8A3828	Thermometer PH–28, tank and tray, 5″, 20–120° F.
8A2800	Paddle PH–80, print, hard rubber, 12″.
8A3430	Rod PH–230, stirring, 10″.
8A2952.2	Plate PH–152, ferrotype, 14″ x 20″, *or*
8A2952A.2	Plate, ferrotype, 14″ x 20″.
8A3153/1	Case, carrying.

42. Manufacturers and their addresses.

Abbreviation	*Manufacturer*	*Address*
AE&M	Acme Electric and Mfg. Co	Cuba, N. Y.
SBI	Simmon Brothers, Inc	37–06 36th St., Long Island City, N. Y.

[A. G. 062.11 (4–13–43).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

IC, 11, 19 (10).

(For explanation of symbols see FM 21–6.)

U. S. GOVERNMENT PRINTING OFFICE: 1943